

How Patient Cost-Sharing Trends Affect Adherence and Outcomes

A Literature Review

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ABSTRACT

Objective: We sought to assess the relationship between patient cost sharing; medication adherence; and clinical, utilization, and economic outcomes.

Methodology: We conducted a literature review of articles and abstracts published from January 1974 to May 2008. Articles were identified using PubMed, Ovid, MEDLINE, Web of Science, and Google Scholar databases. The following terms were used in the search: adherence, compliance, copay, cost sharing, costs, noncompliance, outcomes, hospitalization, utilization, economics, income, and persistence.

Results: We identified and included 160 articles in the review. Although the types of interventions, measures, and populations studied varied widely, we were able to identify relatively clear relationships between cost sharing, adherence, and outcomes. Of the articles that evaluated the relationship between changes in cost sharing and adherence, 85% showed that an increasing patient share of medication costs was significantly associated with a decrease in adherence. For articles that investigated the relationship between adherence and outcomes, the majority noted that increased adherence was associated with a statistically significant improvement in outcomes.

Conclusion: Increasing patient cost sharing was associated with declines in medication adherence, which in turn was associated with poorer health outcomes.

Key words: adherence, cost sharing, copays, outcomes, compliance

INTRODUCTION

Health care spending in the U.S. has climbed to \$2.2 trillion annually, up from \$2.0 trillion in 2005.^{1,2} On a per-capita basis, this amounts to \$7,400 spent per person per year and to employers' costs of more than \$9,300 for annual family coverage.³ Although these estimates are astonishing, they are not surprising—the growth in health care spending has been surpassing the growth of the overall economy for more than

four decades.⁴ Of great interest, however, are the growth rates within health care service areas. High-growth services comprise the key targets for reform efforts by payers, purchasers, and other cost-conscious stakeholders within the health care system. Although prescription drugs are one of the “lower-ticket” service types (at 10% of total spending), they are one of those target areas.

Spending for drug therapies has increased by 89% since 2000, compared with a rate of only 67% for the “higher-ticket” hospital and physician services, which account for more than half of annual health care expenditures.² Factors contributing to increased drug spending include not only higher prices for specialty and biotech therapies⁵ but also greater use of pharmaceuticals for a wider range of conditions and for longer periods to treat chronic illnesses.⁶ Thus, most efforts to control drug expenditures have targeted drug utilization by curbing demand for costly therapies via changes in drug coverage and in benefit design.

Strategies that have been commonly used to curb drug utilization include higher copayments, co-insurance plans, more restrictive formulary listings, and a move from branded products to less expensive generic brands through mandatory substitution. If these tools are implemented effectively, they can decrease costs by reducing the moral hazard of health insurance and by causing patients to realize the true cost of medications through their higher out-of-pocket expenses.

In theory, these steps should deter the overuse of nonessential therapies and should direct patients toward taking drugs that offer a therapeutic benefit at a lower cost, thus maximizing value. However, obtaining these results hinges on an important assumption—that high-value and low-value drugs can be differentiated and that patients will actively continue to use high-value drugs to receive the therapeutic benefit. If this assumption is met and if the links between uninterrupted medication use and future disease burden and costs are established, a greater value should be attained in the pharmacy benefit, along with, perhaps, a positive return on investment—particularly in conditions for which pharmaceuticals play a crucial role in effective disease management.⁷

There is a need, therefore, to examine the evidence base for support of these assumptions and presumed associations. Of

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particular interest is the question of whether cost sharing or other cost-containment techniques that shift the financial burden to patients lead to decreased adherence. If they do, to what extent are changes in adherence based on the degree of change in cost sharing?

A related question, if we assume that cost sharing affects adherence, is whether decreased adherence leads to poorer health outcomes. Although it is generally accepted that decreased adherence results in worse clinical outcomes, greater use of other health services, and higher costs,⁷ the results have been ambiguous in studies of patients who are not chronically ill.⁶ Moreover, with the new interest in personalized benefit designs that categorize patients and consider total costs of care, examining the existing body of evidence for these significant linkages has the potential to influence future benefit strategies aimed at achieving maximum value in all patient groups and to replace the “one-size-fits-all” approaches that emphasize cost-containment measures primarily.^{7,8}

Our study sought to address these issues and to inform managed care decision makers who must consider the point at which additional cost shifting to patients adversely affects medication adherence and subsequent outcomes. To meet this objective, we conducted a comprehensive literature review to examine the effects of increased cost sharing on adherence and outcomes in patients with neurological, cardiovascular, mental health, metabolic, and pulmonary disorders. Although previous review articles have assessed aspects of the relationships of interest in earlier time periods, our review focuses on the most recent evidence for four distinct aspects:

- whether increased cost sharing leads to decreased adherence
- to what extent adherence is changed based on the degree of change in cost sharing
- whether increased adherence results in improved clinical, utilization, and economic outcomes, irrespective of cost sharing
- whether there was a link between cost sharing and health outcomes for studies in which cost sharing and outcomes were measured simultaneously

Ongoing primary research seeks to optimize value in a more concise and often treatment-specific approach, whereas our goal in summarizing the evidence was to translate valuable insights into lessons learned.

Study Selection

In 1975, a widely cited article by Roemer (“Copayments for ambulatory care: Penny-wise and pound-foolish”) was one of the first to evaluate the effects of cost sharing on the utilization of resources in a cohort of patients while applying statistical techniques to adjust for the critical differences between the cohort and controls.⁹ For our literature review, we evaluated articles published one year before the Roemer article (1975).

We identified articles and abstracts published from January 1974 to May 2008 using PubMed, Ovid, MEDLINE, Web of Science, and Google Scholar databases. These articles included the following search terms: adherence, compliance, copay, cost sharing, costs, noncompliance, outcomes, hospitalization,

utilization, economics, income, and persistence.

From the basket of studies with those terms, articles were excluded if they were published before 1974; did not address a chronic disease state; were not original empirical research; were published in a language other than English; did not relate cost sharing to medication adherence or outcomes; or analyzed study populations located outside the U.S. and Canada.

Study Classification

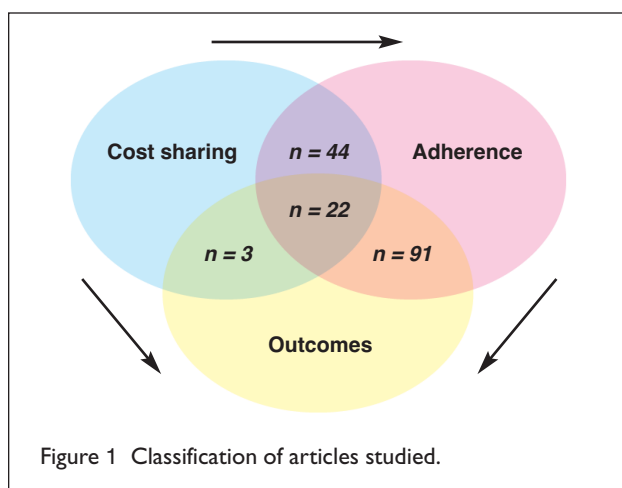
As a result of heterogeneity in the measurement of adherence and cost sharing, literature addressing the effect of cost sharing is somewhat diffuse. Medication adherence, for instance, is commonly defined in at least five ways, including the medication possession ratio, proportion of days covered, cumulative multiple-refill gap, number of prescriptions, and aggregate days supplied.^{10,11} Similarly, changes in cost sharing can occur by modifying the patient’s copayment, the rate of co-insurance, the deductible, or the number of formulary tiers. To be as comprehensive as possible, we accepted all of these definitions for the studies included in our assessment.

To examine the relationship between adherence and outcomes, we also included studies not directly linked to cost sharing. With or without the inclusion of a cost-sharing parameter, outcomes were classified into three domains:

- Clinical outcomes were related to improvements in symptoms or changes in blood pressure (BP) or glycosylated hemoglobin (HbA_{1c}) levels, for example.
- Utilization outcomes included measures related to the use of health services such as emergency department (ED) visits, outpatient visits, hospitalizations, nursing-home admissions, readmissions, and length of stay.
- Economic outcomes consisted of total health care costs, including pharmacy and medical costs.

RESULTS

A total of 160 articles^{9,12-170} met the selection criteria and were included in the assessment; 66 articles (41%) evaluated the effect of cost sharing on medication adherence, and 113 articles (71%) evaluated the effect of adherence on outcomes. As shown in Figure 1, there was some overlap between the two categories of articles, allowing for direct assessment of the



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Table 1 Characteristics of Articles Investigating Patient Cost-Sharing Amount and Medication Adherence

<i>Concept studied</i>	
Impact of cost sharing on adherence	44 (67%)
Impact of cost sharing on adherence and outcomes	22 (33%)
<i>Study design</i>	
Retrospective	56 (85%)
Prospective	9 (14%)
Cross-sectional	1 (2%)
<i>Population studied</i>	
Commercially insured	57 (86%)
Medicare, other publicly insured	9 (14%)
<i>Treatment or disease area studied</i>	
Cardiovascular	20 (31%)
Diabetes	5 (7%)
Mental health	3 (4%)
Pulmonary	3 (4%)
Arthritis	2 (3%)
Infectious disease	1 (2%)
Gastrointestinal disease	2 (3%)
General	30 (46%)
<i>Adherence: operational definition</i>	
Number of filled prescriptions over a set time period	25 (38%)
Medication possession ratio (MPR)	20 (30%)
Combination of number of refills and medication possession ratio	2 (4%)
Patient self-report	10 (15%)
Other (i.e., initiation, discontinuation, elasticity)	8 (12%)
<i>Relationship between cost sharing and adherence</i>	
Statistically significant, inverse relationship	56 (85%)
No relationship or no statistically significant relationship	10 (15%)

effect of cost sharing and outcomes. Of the 66 articles evaluating the effect of cost sharing on adherence, 22 also included outcomes within that assessment.

In addition to these 22 articles, three articles evaluated cost sharing and outcomes (but not adherence), bringing the total number of articles evaluating the relationship between cost sharing and outcomes to 25.

Cost Sharing and Medication Adherence

Table 1 provides an overview of the characteristics of the articles assessing patient cost sharing and medication adherence. Most of the articles focused only on the relationship between cost sharing and adherence and did not assess effects on health outcomes; they were retrospective in nature and included data from commercially insured populations.

Overall, adherence was most commonly defined as the number of prescriptions filled over a specified time period (37.8%), the medication possession ratio (30.4%), or a combination of these measures (4.4%). In addition, 10 studies^{12–21} included

patient self-reporting as the measure of adherence; the remaining studies used metrics such as initiation and discontinuation. All articles except two^{22,23} specifically assessed the effect of increased cost sharing on adherence. The remaining two studies assessed the effect of reduced copays for five drug classes²³ and the effect of copay reductions on all diabetes medications.²²

Of the 66 studies, 56 (85%) demonstrated a statistically significant relationship between increased patient cost sharing and decreased medication adherence.^{9,12–19,22–26,28–68,78} The remaining 10 studies (15%) demonstrated either limited or nonsignificant findings for the cost-sharing/adherence relationship (Table 1).^{27,69–77}

Quantifying the relationship between changes in copays and patient cost sharing and changes in medication adherence was often complicated by the presence of other interventions during the same study period. For example, many studies included changes in the copay tier (e.g., from tier 2 to tier 3 or higher) along with changes in patient copay amounts. Other studies included a switch from copays to co-insurance along with introduction of a deductible based on the patient's income status.

Similarly, many studies looked at multiple classes or a wide variety of patient types (e.g., new versus continuing users, different age groups) over long time periods to increase the sample size or to investigate how different characteristics might affect any identified relationship; however, these studies did not provide clear information about the actual changes in patient cost sharing within all patient subgroups to accurately assess the relationship between cost sharing and adherence.

After we excluded studies in which it was not possible to quantify a change in patient cost sharing or in medication adherence, 24 studies remained for further analysis. As shown in Table 2, there was still a wide variety of these articles in terms of populations studied, methods used, and final results. Of the 24 studies included in Table 2, 18 (75%) identified a statistically significant relationship between changes in patient cost sharing and medication adherence, although six studies did not. We could not identify any specific variables that explained the differences in results between these two groups of articles, although it appeared that the six studies with negative findings had tended to have more complex interventions (i.e., changes in cost sharing as well as other changes to benefit design), had targeted more motivated populations or essential medications (e.g., therapy for postmyocardial infarction), or had utilized different methodologies for defining adherence (i.e., with a focus on initiation or discontinuation rates vs. medication possession ratios).

Given the wide variety of intervention types, study populations, and sample sizes, it was a challenge to summarize the studies to provide an estimate of the relationship between changes in patient cost sharing and medication adherence. Figure 2 (see page 48) depicts the results of Table 2 in graphic form, in an attempt to investigate the potential relationship between the two variables. As shown by the linear regression line fitted to the data, for each dollar increase in patient copays, adherence (as measured by these studies) would be expected to decrease by 0.4%. Thus, a \$10 change would be expected to result in a 3.8% drop in adherence overall; however, as

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Table 2 Changes in Patient Cost-Sharing Amount and Adherence

Lead Author	Year of Publication	Medication Classes Studied	Population	Change in Patient Cost-Sharing Amount	Change in Adherence
Roemer ⁹	1975	All	Medicaid	+ \$0.50	−10%
Nelson ³⁵	1984	All	Medicaid	+ \$0.50	−15%
Harris ³⁰	1990	All	Commercial HMO	+ \$1.50	−11%
Ellis ⁵⁰	2004	Lipid-lowering	Commercial	+ \$10.00	−11%
Huskamp ⁵⁴	2005	Antihypertensives, lipid-lowering, proton pump inhibitors	Commercial	+ \$8.00	−10%
Landsman ³³	2005	Nine common classes	Commercial	+ \$5.00	−5%
Roblin ⁵⁷	2005	Diabetes	Commercial	+ \$10.00	−19%
Schultz ⁴⁵	2005	Lipid-lowering	Commercial	+ \$15.00	−10%
Bender ⁴⁶	2006	Asthma	Retail pharmacy	+ \$15.00	−2%
Cole ⁴²	2006	ACE inhibitors, beta blockers for CHF	CHF patients receiving Medicare supplemental benefits	+ \$10.00	−3% −2%
Gibson ⁴³	2006	Lipid-lowering	Commercial	+ \$10.00	−2% (new users) −3% (continuing users)
Goldman ⁴⁴	2006	Lipid-lowering	Commercial	+ \$10.00	−8%
Kessler ³²	2007	10 most common classes	Commercial	+ \$30.00	−2%
Pedan ⁶⁴	2007	Lipid-lowering	Retail pharmacy	+ \$10.00	−2%
Zeber ⁴⁰	2007	Schizophrenia	Veterans	+ \$7.00	−12%
Chernew ²³	2008	Five medication classes	Commercial	−\$12.50	+3%
Colombi ⁶³	2008	Diabetes	Commercial	+ \$10.00 + \$20.00	−7% −20%
Thiebaud ⁶¹	2008	Lipid-lowering	Pharmacy benefit manager	+ \$10.00	−10%
Johnson ²⁷	1997	22 medication classes	Managed Medicare	+ \$3.50	0%*
Motheral ⁷¹	2001	Four medication classes	Commercial	+ \$25.00	−7%*
Motheral ⁷²	1999	All medications	Commercial	+ \$5.00	+6%*
Pilote ⁷⁴	2002	Beta blockers, ACE inhibitors, lipid-lowering, aspirin	Quebec (Canada) health insurance participants, hospitalized for post-myocardial infarction	+ \$20.00	0%*
Williams ⁷⁵	2007	Inhaled corticosteroids	Commercial HMO	+ \$10.00	−3%*
Blais ⁷⁶	2001	Nitrates, antihypertensives, warfarin, benzodiazepines	Quebec (Canada) health insurance participants	+ \$20.00	−2%*

ACE = angiotensin-converting enzyme; CHF = congestive heart failure; HMO = health maintenance organization.

* No statistically significant change.

evidenced by the wide range of results included in the chart, the actual result of such a change might be larger or smaller, depending on the population and intervention affected.

Medication Adherence and Outcomes

Overall, 91 articles examined the relationship between medication adherence and outcomes (Table 3). Adherence in these studies was usually defined by calculating a medication

possession ratio (45.1%) or the number of prescriptions filled over a specified time period (15.4%); however, 10 studies used patient self-reporting as the measure of adherence. Although the design for most studies examining adherence and outcomes was retrospective in nature (59.3%), 30 articles were either prospective studies or randomized clinical trials (33%). Most of the articles (63%) evaluated clinical outcomes (e.g., HbA_{1c}, blood pressure), although a sizable number evaluated

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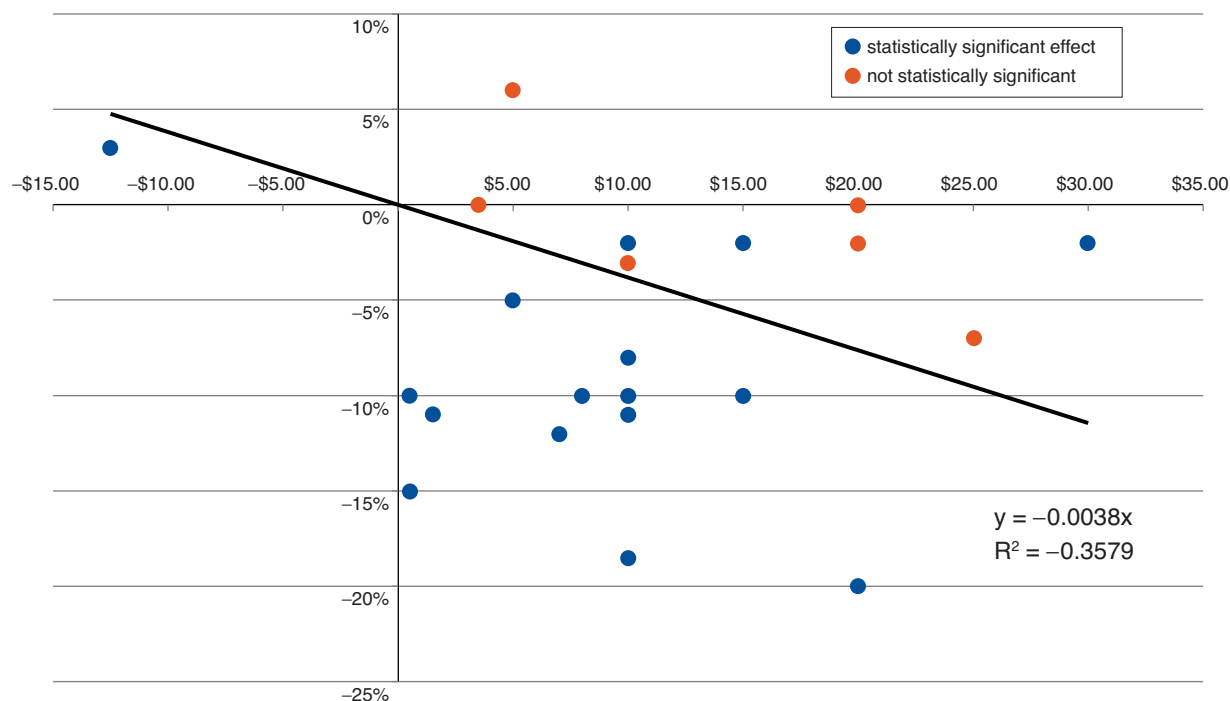


Figure 2 Relationship between changes in patient cost sharing (copays) and medication adherence.

Table 3 Characteristics of Articles Investigating Medication Adherence and Treatment Outcomes

	No. of Articles
<i>Study design</i>	
Retrospective	54 (59%)
Prospective	27 (30%)
Cross-sectional	10 (11%)
<i>Treatment or disease area studied</i>	
Cardiovascular	39 (43%)*
Diabetes	18 (20%)
Mental health	26 (29%)
Pulmonary	14 (15%)
<i>Type of treatment outcome studied</i>	
Clinical outcomes	57 (63%)
Resource use	13 (14%)
Economic outcomes	21 (23%)
<i>Adherence: operational definition</i>	
Medication possession ratio	41 (45%)
Number of prescription refills in set time period	14 (15%)
Patient self-report	10 (11%)
Other	26 (29%)

* Percentages may add up to more than 100% because of overlap of articles.

resource use or economic outcomes (e.g., medical and pharmacy costs).

Table 4 presents an overview of the findings, stratified by disease state and type of treatment outcomes studied. Of the 57 articles exploring adherence and clinical outcomes, 49 (86%) found a positive relationship (increased adherence = improved outcome), one study (2%) found an inverse relationship, and seven studies (12%) did not detect any relationship.

Similar trends were observed in articles addressing the relationship between adherence and utilization or economic outcomes. Most of the articles reported a positive relationship (improved adherence = improved outcomes); a few articles detected a negative relationship. Within utilization outcomes, 81% were significantly positive, 3% were significantly negative, and 16% were neutral. Within economic outcomes, 57% were significantly positive, 14% were significantly negative, and 29% were neutral.

We did not identify any other obvious traits that distinguished between studies that found or did not find a positive relationship between adherence and outcomes, and no differences existed with respect to the article's publication year, sample size, operational definitions, or research methodology. As in any study of health care resource utilization and outcomes, it is likely that a number of unmeasured effects might have affected some analyses more than others; however, given that most studies revealed similar results, the relationship between adherence and outcomes does appear to be measurable.

Cost Sharing and Outcomes

Twenty-five studies directly assessed the association between cost sharing and outcomes.^{9,12,16-18,20-22,24-27,40-45,63,69-71,74,75,79}

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All studies except three^{20,21,79} included an assessment of medication adherence. The majority of studies (14 of 25, or 56%) examined more than one therapeutic class, whereas seven studies assessed cardiovascular treatments,^{17,18,42–45,74} two evaluated diabetes treatment,^{16,63} one covered arthritis,⁴¹ and one examined asthma.⁷⁵ We examined the effect of cost sharing for these therapies for a wide array of non-medication outcomes, including medical costs, adverse events, self-reported health status, and symptoms, as well as ED visits, outpatient visits, office visits, preventive services, hospitalizations, and nursing-home admissions.

Overall, 19 of 25 studies (76%) indicated that increased patient cost sharing adversely affected outcomes. The remaining six studies indicated that an increase in cost sharing did not affect medical utilization or the number of medical visits^{27,69–71,74,75} or costs.^{27,43,70} A study by Kephart et al.³⁹ indicated that increased patient cost sharing was associated with increased hospital and ED admissions, with no effect on total costs.

In the evaluation of the six studies that demonstrated no effect on outcomes, five found that adherence was not significantly affected by an increase in cost sharing.^{69–71,74,75} Given the hypothesis that the effect of cost sharing on outcomes is mediated through adherence, it is conceivable that outcomes should not be affected in these studies, because adherence was not affected. However, Johnson et al.²⁷ found that an increase in copays adversely affected adherence without any consistent negative impact on medical care utilization (i.e., office and ED visits and hospitalizations) or non-drug medical care expenditures resulting from copay increases. In the Johnson study, initial periods of increased cost sharing in one population were associated with a negative effect on medical care utilization; however, subsequent increases showed no effect.

DISCUSSION

Our literature review evaluated the relationship between patient cost sharing, medication adherence, and outcomes in terms of four aspects:

1. whether more cost sharing results in less adherence
2. to what extent adherence is changed according to the degree of change in cost sharing
3. whether increased adherence leads to improved clinical, utilization, and economic outcomes, irrespective of patient cost sharing
4. whether there is a relationship between cost sharing and outcomes for studies in which cost sharing and outcomes were measured simultaneously

Approximately 85% of studies that examined changes in patient cost sharing revealed that increasing cost sharing had a negative effect on adherence. When analyzing the effect of cost sharing on adherence in studies involving changes in cost sharing and adherence estimates, we noted a wide variation in measured effects, possibly a result of differences in underlying populations, methods, and operational definitions. However, the overall trend was an inverse relationship; for all increases in cost sharing, an expected decrease in adherence could be expected.

When studies assessing adherence and outcomes were evaluated, irrespective of cost sharing, the preponderance of evidence supported a significant positive relationship between changes in adherence and changes in treatment outcomes, irrespective of type of outcome (clinical, resource use, or economic) or disease state (cardiovascular, respiratory, or mental health).

Table 4 Impact of Medication Adherence Changes on Treatment Outcomes, by Outcome Type and Disease Area Studied

	Clinical Outcomes		Resource Utilization		Economic Outcomes	
	Total No. of Articles	Percentage With Positive Significant Relationship	Total No. of Articles	Percentage With Positive Significant Relationship	Total No. of Articles	Percentage With Positive Significant Relationship
Diabetes	10	80%	6	100%	7	86%
Hypertension	11	73%	3	100%	3	67%
Coronary artery disease	12	83%	4	75%	2	100%
Depression	3	100%	2	100%	8	38%
Schizophrenia	4	100%	7	86%	3	67%
Asthma or COPD	9	67%	10	70%	1	100%
Postmyocardial infarction	9	100%	1	100%	—	—
Bipolar disorder	4	75%	2	50%	1	100%
Congestive heart failure	4	75%	2	50%	1	100%
Seizure disorder	1	100%	—	—	—	—

COPD = chronic obstructive pulmonary disease.

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It still needs to be determined, as Roehmer et al. asked, whether increasing cost sharing is “penny-wise and pound-foolish.”⁹ Our study and similar earlier reviews highlight the fact that increasing cost sharing decreases adherence and adversely affects outcomes. Yet the underlying premise of this strategy—overall cost reduction—has been neither supported nor refuted. Almost half of the studies included in the assessment showed a beneficial effect on economic outcomes, although, by far, it was in this domain that the literature was the most sparse.

To resolve this question, we recommend future studies that can assess reductions in pharmacy costs against the potential increased expense resulting from the additional use of health care resources and total medical costs. Research should also continue to evaluate when and how increased patient cost sharing is beneficial and when it is deleterious, as a one-size-fits-all approach is usually not the right solution. For example, the result of increased cost sharing for a “silent” condition such as diabetes may differ greatly from that for a symptomatic condition, such as chronic obstructive pulmonary disease (COPD). Basic economic theory leads us to believe that a patient’s income and the number of medications being filled, and paid for, can also have a substantial effect.

Our review indicates that a broad approach is generally not supported by the literature; further, success is more likely if we can develop better cost-sharing strategies to ensure that patients will receive the best value for the drugs that they buy and if we can capitalize on established relationships between out-of-pocket costs, adherence, and outcomes. Indeed, approaching benefit design using a scalpel, rather than an ax, may result in increased value not only for the pharmacy benefit but also for the wide range of coverage for health care services.

STUDY LIMITATIONS

As with most types of studies, literature reviews are not without limitations. Publication bias may exist when only a few studies that show no effect among the relationships of interest are available. The articles identified in this review covered a wide range of patient populations, interventions, and methodologies. In many instances, the effect of changes in patient cost sharing was heavily intertwined with other interventions that were introduced at the same time—the result of conducting research in a real-world setting. This situation often inhibits the ability to directly quantify the effect of increased copays on adherence.

The relationship between cost sharing and medication adherence can be affected by other factors, such as the patient’s underlying disease state. For example, patients being treated for symptomatic conditions are more likely to remain more adherent, even with changes in cost sharing, than patients with less apparent or less severe symptoms. Although some articles attempted to address this difference by categorizing treatments, neither the categories nor the methods were consistent for all articles.

Despite these limitations, our review of the available literature, as well as the general trend of the results observed, suggests that managed care decision makers should carefully consider the implications of increased cost sharing in each subgroup within their specific populations.

CONCLUSION

With health care spending projected to exceed 20% of the U.S. gross domestic product by 2018,⁴ with more than 75% of all employees subject to a tier 3 or tier 4 pharmacy benefit,³ and with more than 40% of employers stating that they are likely to raise employees’ out-of-pocket costs for prescription drugs in 2012, our findings have particular relevance. Health care decision makers are undoubtedly planning to continue increasing the level of patient cost sharing for prescription drugs to slow the rising costs of health care; however, this approach may be shortsighted and counterproductive because increases in medical utilization attributable to poorer outcomes may outweigh the savings from lower prescription drug use, particularly when results for the total cost of care are evaluated over long periods of time.⁷

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